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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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47514 7590 04/03/2008 FLETCHER YODER (CHEVRON PHILLIPS) P. O. BOX 692289 HOUSTON, TX 77069			EXAMINER LEUNG, JENNIFER A	
			ART UNIT 1797	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/700,006	Applicant(s) VERSER ET AL.	
	Examiner JENNIFER A. LEUNG	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6-16, 20-22, 24, 25, 27-36, 39-41 and 43-52 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 6-16, 20-22, 24, 25, 27-36, 39-41 and 43-52 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Response to Arguments

2. Applicant's arguments filed February 15, 2008 with respect to the rejections of claims 1-3, 6-16, 20-22, 24, 25, 27-36, 39-41 and 43-52 under 35 U.S.C. §103 have been fully considered and are persuasive. Therefore, the rejections have been withdrawn. However, upon further consideration, new grounds of rejection are made in view of the newly applied prior art, below.

Claim Objections

3. Claims 28 and 51 are objected to because of the following informalities:

In claim 28, "potion" should be changed to --portion--.

In claim 51, it appears that "the second stream" (i.e., separated purge gas, see claim 50) should be changed to --the third stream-- (i.e., primarily hydrocarbon, see claim 50). As noted from FIG. 1, the second stream (60) is returned to the purge vessel (24), whereas the third stream (53 or 55) is sent to the recycle tank (30) and/or the fractionation system (32, 34).

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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4. Claims 46-48 are rejected under 35 U.S.C. 102(b) as being anticipated by Hottovy et al. (WO 00/53306).

Regarding claims 46 and 47, Hottovy et al. (figure; generally, page 2, line 30 to page 12, line 5) discloses a method of processing effluent of a polymerization reactor (i.e., loop reactor **10**), the effluent comprising hydrocarbon liquid and polymer solids, the method comprising:

separating a majority of the hydrocarbon liquid from the polymer solids in the effluent by flashing the majority of the hydrocarbon liquid (i.e., in a high pressure flash chamber **28**; see page 8, line 29 to page 9, line 31) to generate a hydrocarbon vapor;

transporting (i.e., in line **32**, **62**) and condensing the hydrocarbon vapor (i.e., using a diluent recycle cooler **68**) to form a recovered hydrocarbon liquid;

transporting an equilibrium vapor (i.e., in line **76**) of the recovered hydrocarbon liquid without compression to a fractionation system (i.e., comprising columns **92**, **98**); and

recycling at least a portion of the recovered hydrocarbon liquid (i.e., in line **74**) to the polymerization reactor **10** without fractionating the recovered hydrocarbon liquid, wherein the recycling comprises transporting the recovered hydrocarbon liquid to a recycle tank (i.e., a surge vessel **72**) and pumping (i.e., using pump **77**) the recovered hydrocarbon liquid from the recycle tank **72** to the polymerization reactor **10**, (see page 6, lines 22-31).

Regarding claim 48, Hottovy et al. discloses processing the equilibrium vapor in the fractionation system **92,98** to generate a diluent substantially free of olefin for use in catalyst preparation and delivery (i.e., by recycling the diluent in line **102** to a catalyst mud pot **106**; see column 10, line 25 to page 11, line 4).

Instant claims 46-48 read on the method of Hottovy et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 2, 6-14, 25, 27-35, 36, 39-41, 43 and 49-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hottovy et al. (WO 00/53306) in view of Sherk et al. (US 4,501,885).

Regarding claims 1, 14 and 52, Hottovy et al. (see figure; generally, page 2, line 30 to page 12, line 5) discloses a process for slurry polymerization and for separating hydrocarbon fluid from solid polymer particles and purge gas, the process comprising:

polymerizing in a loop reactor **10** at least one olefin monomer to produce a slurry comprising solid polymer particles and hydrocarbon fluid (see page 2, line 30 to page 4, line 1);
withdrawing a portion of the slurry (i.e., via mechanism **22**) from the reaction zone **10**;
separating at least a majority of the hydrocarbon fluid from the solid polymer particles in an intermediate pressure zone (i.e., in flash chamber **28**; see page 8, line 29 to page 9, line 4; page 9, lines 16-25) as a vaporized hydrocarbon fluid stream;

condensing the vaporized hydrocarbon fluid stream in a condensing zone (i.e., in a diluent recycle cooler **68**), whereby a condensed hydrocarbon fluid stream is formed;

transferring the condensed hydrocarbon fluid stream from the condensing zone **68** to the recycle zone (i.e., a surge vessel **72**); and

transferring (i.e., via line **74**) at least a majority of the condensed hydrocarbon fluid in the recycle zone to the reaction zone **10** without fractionating.

Hottovy et al. further suggests the provision of some form of polymer solids purging, since it is disclosed that, “[o]ther minor diluent-containing streams such as fluff drying purge (typically containing, in addition to diluent, minor amounts of lights such as nitrogen and ethylene as well as 1-hexene comonomer) can also be fed to degassing column **92** if desired,” (see page 8, lines 8-11). Hottovy et al., however, is silent as to the process comprising the instantly claimed purging process.

Sherk et al. (see figure; column 2, line 10 to column 4, line 25) teaches a purging process comprising the steps of transferring solid polymer particles from an intermediate pressure zone (i.e., flash chamber **16**) to a purge zone (i.e., purge column **20**) in which a purge gas (i.e., nitrogen) is passed through the solid polymer particles to remove entrained hydrocarbon fluid, thereby forming a mixed stream containing hydrocarbon vapor and purge gas; transferring the mixed stream to a recovery zone (i.e., comprising elements **42**, **44**, **48**, etc.) where the purge gas and the hydrocarbon fluid are separated to form a recovered purge gas stream (i.e., in line **50**) and a recovered hydrocarbon fluid stream (i.e., labeled as isobutane; other suitable hydrocarbon diluents discussed at column 2, lines 19-28); and passing at least a portion of the recovered purge gas stream from the recovery zone to the purge zone **20** (i.e., via line **50**). The recovered

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hydrocarbon fluid stream is passed to a purification zone where it can readily be purified for reuse in the polymerization process (see column 3, lines 2-5).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the purging process as taught by Sherk et al. in the process of Hottovy et al., because the purging of polymer solids in combination with the separation/recovery of hydrocarbon fluid from the purge gas would have minimized operating costs and hydrocarbon emissions, by allowing for the residual hydrocarbon to be recovered and reused in the polymerization process, as taught by Sherk et al. (see column 1, lines 27-59; column 3, lines 2-5). In addition, it would have been within the skill level of one having ordinary skill in the art to provide the steps of passing portions of the recovered hydrocarbon fluid stream to the fractionation zone and the recycle zone in the process of Hottovy et al., because the steps would have allowed for the recovered hydrocarbon fluid to be further purified prior to its reuse in the polymerization process, as specifically suggested by Sherk et al.

Regarding claim 2, as best understood, Sherk et al. teaches the step of passing a second portion of the recovered purge gas stream **50** from the recovery zone to a closed loop transfer zone (see closed flow loop in the figure).

Regarding claims 6 and 7, Hottovy et al. discloses transferring vapor/substantially no liquid from the recycle zone **72** to the fractionation zone **92,98** (i.e., via line **76**; see figure, page 6, lines 23-26).

Regarding claim 8, Hottovy et al. discloses transferring liquid hydrocarbon (i.e., via line **102**) from the fractionation zone **92,98** to a catalyst preparation zone **106** (see figure).

Regarding claim 9, Sherk et al. teaches that the recovery unit is not connected to a purge

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gas flare (i.e., a flare is not used because the stream is recycled; the recovery unit in Sherk et al. is an improvement over past configurations that included flares; see column 1, lines 49-59).

Regarding claims 10-13, Sherk et al. further teaches that the recovered purge gas stream contains a very low concentration of hydrocarbon (see column 3, lines 54-60; column 3, line 67 to column 4). Although the claimed concentrations of hydrocarbon in the recovered purge gas stream (in ppm) are not explicitly taught by Sherk et al., it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate concentration of hydrocarbon (in ppm) for the recovered purge gas stream in the modified process of Hottovy et al. (e.g., to optimize the amount of hydrocarbon recyclable to the polymerization process, relative to the operating expense of providing additional recovery, etc.) because it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller*, 105 USPQ 233.

Regarding claims 25 and 34, Hottovy et al. (see figure; generally, page 2, line 30 to page 12, line 5) discloses a process for slurry polymerization and for separating hydrocarbon fluid from solid polymer particles and purge gas, said process comprising:

polymerizing in a reaction zone **10** at least one olefin monomer to produce a slurry, comprising solid polymer particles and hydrocarbon fluid (see page 2, line 30 to page 4, line 1);

withdrawing a portion of the slurry from the reaction zone (i.e., via mechanism **22**);

separating at least a majority of the hydrocarbon fluid from the solid polymer particles in an intermediate pressure zone as a vaporized hydrocarbon fluid stream (i.e., in high pressure flash chamber **28**; see page 8, line 29 to page 9, line 4; page 9, lines 16-25);

condensing the vaporized hydrocarbon fluid stream in a condensing zone (i.e., using a

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diluent recycle cooler **68**), whereby a condensed hydrocarbon fluid stream is formed;

transferring the condensed hydrocarbon fluid stream from the condensing zone to a recycle zone (i.e., comprising a surge vessel **72**; see page 6, lines 22-31);

transferring vapor (i.e., via line **76**) from the recycle zone **72** to a fractionation zone (i.e., comprising columns **92,98**); and

transferring hydrocarbon liquid (i.e., via line **74**) from the recycle zone **72** to the reaction zone **10** without fractionating the hydrocarbon liquid.

Hottovy et al. further suggests the provision of some form of polymer solids purging, since it is disclosed that, “[o]ther minor diluent-containing streams such as fluff drying purge (typically containing, in addition to diluent, minor amounts of lights such as nitrogen and ethylene as well as 1-hexene comonomer) can also be fed to degassing column **92** if desired,” (see page 8, lines 8-11). Hottovy et al., however, is silent as to the process comprising the instantly claimed purging process.

Sherk et al. (see figure; column 2, line 10 to column 4, line 25) teaches a purging process comprising the steps of transferring solid polymer particles from the intermediate pressure zone (i.e., a flash chamber **16**) to a purge zone (i.e., a purge column **20**) in which a purge gas (i.e., nitrogen) is passed through the solid polymer particles to remove entrained hydrocarbon fluid, thereby forming a mixed stream containing hydrocarbon vapor and purge gas; transferring the mixed stream to a recovery zone (i.e., comprising elements **42, 44, 48**, etc.) where the purge gas and hydrocarbon fluid are separated to form a recovered purge gas stream (i.e., in line **50**) and a recovered hydrocarbon fluid stream (i.e., labeled as isobutane; other suitable hydrocarbon diluents discussed at column 2, lines 19-28); and passing at least a portion of the recovered purge

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gas stream (via line **50**) from the recovery zone to the purge zone **20**. The recovered hydrocarbon fluid may then be passed to a purification zone where it can readily be purified for reuse in the polymerization process (see column 3, lines 2-5).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the purging process as taught by Sherk et al. in the process of Hottovy et al., because the step of purging in combination with the step of recovery would have minimized operating costs and hydrocarbon emissions, by allowing for the residual hydrocarbon to be recovered and reused in the polymerization process, and by allowing for the purge gas to be recovered and reused in the purging zone, as taught by Sherk et al. (see column 1, lines 27-59; column 3, lines 2-5). In addition, it would have been within the skill level of one having ordinary skill in the art to pass at least a portion of the recovered hydrocarbon fluid stream from the recovery zone to the recycle zone, because the step would have enabled the recovered hydrocarbon fluid to be purified prior to its reuse in the polymerization process, as specifically suggested by Sherk et al.

Regarding claim 27, Hottovy et al. discloses transferring substantially no liquid (i.e., in line **76**) from the recycle zone **72** to the fractionation zone **92,98** (see page 6, lines 23-26).

Regarding claim 28, Hottovy et al. discloses transferring a minor portion of liquid hydrocarbon from the fractionation zone to a catalyst mud preparation zone and a major portion of the liquid hydrocarbon from the fractionation zone to the recycle zone (page 10, lines 12-24).

Regarding claim 29, Sherk et al. teaches that the recovery unit is not connected to a purge gas flare (i.e., a flare is not used because the stream is recycled; the recovery unit in Sherk et al. is an improvement over past configurations that included flares; see column 1, lines 49-59).

Regarding claims 30-33, Sherk et al. further teaches that the recovered purge gas stream contains a very low concentration of hydrocarbon (see column 3, lines 54-60; column 3, line 67 to column 4). Although the claimed concentrations of hydrocarbon in the recovered purge gas stream (in ppm) are not explicitly taught by Sherk et al., it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an appropriate concentration of hydrocarbon (in ppm) for the recovered purge gas stream in the modified process of Hottovy et al. (e.g., to optimize the amount of hydrocarbon recyclable to the polymerization process, relative to the operational expense of providing additional recovery, etc.) because it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, *In re Aller*, 105 USPQ 233.

Regarding claim 35, Sherk et al. teaches that the recovered purge gas stream **50** is at least partially used as a motive force to the polymer particles which have already passed through the purge zone **20** (see intersection of line **50** with the stream exiting the purge column **20**; figure).

Regarding claim 36, Hottovy et al. (see figure; generally, page 2, line 30 to page 12, line 5) discloses an apparatus comprising:

- (a) a loop polymerization reactor **10** in which one or more olefins are polymerized to form solid polymer particles in a hydrocarbon fluid (see page 2, line 30 to page 4, line 1);
- (b) an intermediate pressure chamber (i.e., high pressure flash chamber **28**; see page 8, line 29 to page 9, line 4; page 9, lines 16-25) adapted to separate hydrocarbon fluid from the solid polymer particles, the chamber having an inlet (i.e., in communication with line **24**) for receiving hydrocarbon fluid and solid polymer particles from the polymerization reactor, a polymer outlet (i.e., in communication with line **34**) for discharging solid polymer particles, and a gas outlet

- (i.e., in communication with line **32**) for discharging vaporized hydrocarbon fluid;
- (c) a condenser (i.e., a diluent recycle cooler **68**) fluidically connected to the gas outlet of the intermediate pressure chamber, the condenser adapted to condense the flashed hydrocarbon fluid by heat exchange and without compression;
- (f) a recycle tank (i.e., vessel **72**) adapted to receive hydrocarbon liquid from the condenser;
- (g) a liquid delivery conduit (i.e., line **74**) fluidically connecting a bottom portion of the recycle tank **72** with the polymerization reactor **10**, wherein the fluidic connection between the recycle tank and the reactor does not include a fractionation column; and
- (h) a vapor delivery conduit (i.e., line **76**) fluidically connecting a top portion of the recycle tank **72** with a first fractionation column **92**.

Hottovy et al. further suggests the provision of some form of purging, since it is disclosed that, “[o]ther minor diluent-containing streams such as fluff drying purge (typically containing, in addition to diluent, minor amounts of lights such as nitrogen and ethylene as well as 1-hexene comonomer) can also be fed to degassing column **92** if desired,” (see page 8, lines 8-11).
Hottovy et al., however, is silent as to the apparatus comprising the claimed purge configuration.

Sherk et al. (see figure; column 2, line 10 to column 4, line 25) teaches an apparatus comprising a purge column **20** fluidically connected to the polymer outlet of the intermediate pressure chamber (i.e., a flash chamber **16**) and adapted to receive the solid polymer particles from the intermediate pressure chamber; and a hydrocarbon/purge gas recovery unit (i.e., comprising elements **42**, **44**, **48**, etc.) adapted to separate hydrocarbon fluid (i.e., labeled as isobutane in the figure) from purge gas (i.e., nitrogen, in line **50**), wherein the recovery unit is fluidically connected to a top portion of the purge column **20** and adapted to receive a fluid

stream comprising purge gas and hydrocarbon fluid from the purge column **20**. The separated hydrocarbon fluid can be passed to a purification zone where it can readily be purified for reuse in the polymerization process (see column 3, lines 2-5).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a purge column and a hydrocarbon/purge gas recovery unit in the apparatus of Hottovy et al., because the purge column in combination with the hydrocarbon/purge gas recovery unit would have minimized operating costs and hydrocarbon emissions, by allowing for the residual hydrocarbon to be recovered and reused in the polymerization process, as taught by Sherk et al. (see column 1, lines 27-59; column 3, lines 2-5). In addition, it would have been within the skill level of one having ordinary skill in the art to configure the recycle tank in the apparatus of Hottovy et al. so that it was further adapted to receive the hydrocarbon fluid from the hydrocarbon/purge gas recovery unit, because the configuration would have enabled the recovered hydrocarbon fluid to be purified prior to its reuse in the polymerization process, as specifically suggested by Sherk et al.

Regarding claims 39 and 40, Hottovy et al. discloses a second fraction column **98** receiving a top product (line **96**) from the first fractionation column **92** and a liquid delivery conduit (line **102**) from the second fractionation column **98** to a catalyst preparation tank **106**.

Regarding claim 41, Hottovy et al., as an example, discloses the use of ethylene monomer and 1-hexene comonomer in the polymerization reaction (see illustrative embodiment, page 11). Thus, the first fractionation column **92** is configured with a sidedraw **110** for the removal of unreacted 1-hexene comonomer. Hottovy et al., however, discloses that aside from 1-hexene, various other olefin comonomers may be selected, such as butene, 1-pentene, 1-hexene, 1-octene

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and 1-decene (see page 3, lines 3-9). Depending on the particular comonomer selected, a sidedraw may or may not be necessary (i.e., due to the formation of a lighter or heavier fraction, relative to 1-hexene). Accordingly, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to configure the first and second fractionation columns in the modified apparatus of Hottovy et al. to have no sidedraws, on the basis of suitability for providing separation of a specific comonomer from the system.

Regarding claim 43, Sherk et al. teaches that the recovery unit is not connected to a purge gas flare (i.e., a flare is not used because the stream is recycled; the recovery unit in Sherk et al. is an improvement over past configurations that included flares; see column 1, lines 49-59).

Regarding claims 49-51, Hottovy et al. further suggests the provision of some form of polymer solids purging, since it is disclosed that, “[o]ther minor diluent-containing streams such as fluff drying purge (typically containing, in addition to diluent, minor amounts of lights such as nitrogen and ethylene as well as 1-hexene comonomer) can also be fed to degassing column **92** if desired,” (see page 8, lines 8-11). Hottovy et al., however, is silent as to the process comprising the instantly claimed purging process.

Sherk et al. (see figure; column 2, line 10 to column 4, line 25) teaches a purging process in which the polymer solids, subsequent to a flashing step in vessel **16**, is subjected to a step of purging with a purge gas (i.e., with nitrogen, fed to the conveyor dryer **18** and the purge column **20**) to remove residual hydrocarbon entrained in the polymer solids to form a first stream comprising a purge gas and the residual hydrocarbon (i.e., exiting the top of bag filter **22**). Sherk et al. further discloses separating the purge gas from the first stream to form a second stream comprising separated purge gas (i.e., as a recycled nitrogen in line **50**) and a third stream

comprising primarily hydrocarbon (i.e., as a diluent stream, e.g., isobutene as shown in the figure; see also column 2, lines 19-29 for other hydrocarbon diluents). The third stream can be recovered and passed to a purification zone where it can readily be purified for reuse in the polymerization process (see column 3, lines 2-5).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the purging process as taught Sherk et al. in the process of Hottovy et al., because the purging of polymer solids in combination with the separation/recovery of hydrocarbon fluid from the purge gas would have minimized operating costs and hydrocarbon emissions, by allowing for the residual hydrocarbon to be recovered and reused in the polymerization process, as taught by Sherk et al. (see column 1, lines 27-59; column 3, lines 2-5). Furthermore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to further provide the step of transporting the third stream, comprising primarily hydrocarbon, to the recycle tank or the fractionation system or a combination thereof, in the process of Hottovy et al., because the step would have enabled the recovered hydrocarbon to be purified prior to its reuse in the polymerization process, as suggested by Sherk et al.

6. Claims 3, 15, 16, 20-22, 24, 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hottovy et al. (WO 00/53306) in view of Sherk et al. (US 4,501,885) and Saito et al. (US 4,365,057).

Regarding claim 3, the process further comprises the step of feeding the polymer solids to an extrusion zone, since Hottovy et al. discloses that the polymer solids can be “processed in a conventional finishing operation such as a screw extruder” (see page 5, lines 24-29). The collective teaching of Hottovy et al. and Sherk et al., however, fails to disclose the step of

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feeding fresh purge gas to an extrusion feed zone and refraining from feeding fresh purge gas to the purge zone. Saito et al., however, teaches a process comprising the steps of transferring polymer solids to a purge zone (i.e., a drying apparatus **2**), and transferring the purged polymer solids from the purge zone to a feed zone (i.e., drying apparatus **13**). Saito et al. teaches the step of feeding fresh purge gas to the feed zone **13** (i.e., via line **14**) and refraining from feeding fresh purge gas to the purge zone **2** (i.e., fresh purge gas is not fed here; only a recycled purge gas via blower **9** is used). (see figure; generally, column 2, line 17 to column 4, line 4). It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the step of feeding fresh purge gas to an extrusion feed zone and refraining from feeding fresh purge gas to the purge zone in the modified process of Hottovy et al., because the steps would have sufficiently reduced the concentration of a hydrocarbon medium remaining in the polymer solids without using a great amount of energy, as in conventional drying methods, as taught by Saito et al. (see, e.g., column 1, lines 5-10; column 1, line 53 to column 2, line 14). The feed zone taught by Saito et al. defines an extrusion feed zone, since the feed zone feeds the dried polymer downstream, and extrusion is known in the art as the final stage of polymer processing.

Regarding claims 15 and 16, Hottovy et al. (see figure; generally, page 2, line 30 to page 12, line 5) discloses an apparatus comprising:

- (a) a polymerization reactor (i.e., loop reactor **10**) in which one or more olefins are polymerized to form solid polymer particles in a hydrocarbon fluid;
- (b) an intermediate pressure chamber (i.e., a high pressure flash chamber **28**; see page 8, line 29 to page 9, line 4; page 9, lines 16-25) adapted for the separation of hydrocarbon fluid from the solid polymer particles, the chamber having an inlet (i.e., in communication with line **24**) for

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receiving hydrocarbon fluid and solid polymer particles from the polymerization reactor,

a polymer outlet (i.e., in communication with line **34**) discharging solid polymer particles, and a

gas outlet (i.e., in communication with line **32**) discharging vaporized hydrocarbon fluid;

(c) a condenser (i.e., a diluent recycle cooler **68**) fluidically connected to the gas outlet of the intermediate pressure chamber and adapted to condense the vaporized hydrocarbon fluid by heat exchange and without compression;

(f) a recycle tank (i.e., vessel **72**) receiving condensed hydrocarbon from the condenser **68**;

(g) a pump **77** and at least one conduit **74** fluidically connected to a bottom portion of the recycle tank **72**, wherein the pump and the at least one conduit are adapted to transport the condensed hydrocarbon fluid from the recycle tank to the reactor **10** without transporting the condensed hydrocarbon fluid through a fractionation system; and

(h) a vapor delivery conduit **76** coupled to a top portion of the recycle tank **72** and fluidically connected to a first fractionation column **92**.

Hottovy et al. further suggests the provision of some form of purging, since it is disclosed that, “[o]ther minor diluent-containing streams such as fluff drying purge (typically containing, in addition to diluent, minor amounts of lights such as nitrogen and ethylene as well as 1-hexene comonomer) can also be fed to degassing column **92** if desired,” (see page 8, lines 8-11).

Hottovy et al., however, is silent as to the apparatus comprising the claimed purge configuration.

Sherk et al. (see figure; column 2, line 10 to column 4, line 25) teaches an apparatus comprising a purge column **20** fluidically connected to the polymer outlet of the intermediate pressure chamber (i.e., a flash chamber **16**) and adapted to receive the solid polymer particles from the intermediate pressure chamber; and a hydrocarbon/purge gas recovery unit (i.e.,

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comprising elements **42**, **44**, **48**, etc.) adapted to separate hydrocarbon fluid (i.e., labeled as isobutane in the figure) from purge gas (i.e., nitrogen as recycle, in line **50**), wherein the recovery unit is fluidically connected to a top portion of the purge column **20** and adapted to receive a fluid stream comprising purge gas and hydrocarbon fluid from the purge column **20**. The separated hydrocarbon fluid can be passed to a purification zone where it can readily be purified for reuse in the polymerization process (see column 3, lines 2-5).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide a purge column and a hydrocarbon/purge gas recovery unit in the apparatus of Hottovy et al., because the purge column in combination with the hydrocarbon/purge gas recovery unit would have minimized operating costs and hydrocarbon emissions, by allowing for the residual hydrocarbon to be recovered and reused in the polymerization process, as taught by Sherk et al. (see column 1, lines 27-59; column 3, lines 2-5). In addition, it would have been within the skill level of one having ordinary skill in the art to configure the recycle tank **72** in the apparatus of Hottovy et al. so that it was further adapted to receive the hydrocarbon fluid from the hydrocarbon/purge gas recovery unit, because the configuration would have enabled the recovered hydrocarbon fluid to be purified prior to its reuse in the polymerization process, as specifically suggested by Sherk et al.

The apparatus may further comprise an extruder, since Hottovy et al. discloses that the polymer solids can be “processed in a conventional finishing operation such as a screw extruder” (see page 5, lines 24-29). The collective teaching of Hottovy et al. and Sherk et al., however, is silent as to the provision of an extruder feed tank, adapted to receive the solid polymer particles from the purge column, wherein the extruder feed tank comprises a fresh purge gas feed.

Saito et al. (see figure; generally, column 2, line 17 to column 4, line 4) teaches a purge apparatus (i.e., a first drying machine **2**) and a feed tank (i.e., silo type second drying machine **13**) adapted to receive solid polymer particles from the purge apparatus (i.e., via line **11**), wherein the feed tank comprises a fresh purge gas feed (i.e., industrial nitrogen via line **14**).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to provide the feed tank taught by Saito et al. in the modified apparatus of Hottovy et al., because the feed tank, in combination with the purge column, would have sufficiently reduced the concentration of a hydrocarbon medium remaining in the polymer solids without using a great amount of energy, as in conventional drying methods, as taught by Saito et al. (see, e.g., column 1, lines 5-10; column 1, line 53 to column 2, line 14). The feed tank taught by Saito et al. defines an extruder feed tank, since the feed tank feeds the dried polymer downstream, and an extruder is known in the art as the final stage of polymer processing.

Regarding claim 20, Hottovy et al., as an example, discloses the use of a 1-hexene comonomer in the polymerization reaction (see illustrative embodiment, page 11). Thus, the first fractionation column **92** is configured with a sidedraw **110** for the removal of unreacted 1-hexene comonomer. Hottovy et al., however, discloses that aside from 1-hexene, various other olefin comonomers may be selected, such as butene, 1-pentene, 1-hexene, 1-octene and 1-decene (see page 3, lines 3-9). Depending on the particular comonomer selected, a sidedraw may or may not be necessary (i.e., due to the formation of a lighter or heavier fraction, relative to 1-hexene). Accordingly, it would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to configure the first fractionation column in the modified apparatus of Hottovy et al. to have no sidedraw, on the basis of suitability for providing

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separation of a specific comonomer fraction from the system.

Regarding claims 21 and 22, Hottovy et al. discloses a second fractionation column **98** receiving a top product (line **96**) from the first fractionation column **92** and a liquid delivery conduit (line **102**) from the second fractionation column **98** to a catalyst preparation tank **106**.

Regarding claim 24, Sherk et al. teaches that the recovery unit is not connected to a purge gas flare (i.e., a flare is not used because the stream is recycled; the recovery unit in Sherk et al. is an improvement over past configurations that included flares; see column 1, lines 49-59).

Regarding claims 44 and 45, the same comments with respect to Saito et al. apply (see comments in claims 3 and 15 above). Furthermore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to configure the extruder feed tank in the modified apparatus of Hottovy et al. to receive a portion of the purge gas stream exiting the recovery unit, because one having ordinary skill in the art would have known to look to a readily available source of nitrogen gas that contained substantially no hydrocarbon, i.e., the recovered purge gas, in order to minimize the operating costs of the system.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Salmon and Hinton are cited to further illustrate the state of the art.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER A. LEUNG whose telephone number is (571)272-1449. The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Jennifer A. Leung/
Primary Examiner, Art Unit 1797